

Application No. 10/707,979
Docket No. BUR920030198US1

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of

Denton, et al.

Atty. Docket No.: BUR920030198US1

Serial No.: 10/707,979

Group Art Unit: 3624

Filed: January 29, 2004

Examiner: Fleischer, Mark

For: **A METHOD FOR CONSIDERING HIERARCHICAL PREEMPTIVE DEMAND
PRIORITIES IN A SUPPLY CHAIN OPTIMIZATION MODEL**

MAIL STOP NON-FEE AMENDMENT

Honorable Commissioner of Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

AMENDMENT UNDER 37 C.F.R. §1.111

Sir:

In response to the Non-Final Office Action dated **October 12, 2010**, setting a three-month statutory period for response, please consider this timely filed Amendment in the above-identified application as follows:

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows.

1. (Previously Presented) A computer-implemented method for determining a production plan comprising:
 - receiving customer demands for resources from different customers;
 - rank ordering, by a computing device, said customer demands to create prioritized customer demands;
 - aggregating, by said computing device, said prioritized customer demands into a plurality of priority groups based on said rank ordering of said customer demands;
 - optimizing, by said computing device, a first mathematical linear programming model based on processing a highest priority group of said plurality of priority groups;
 - assigning, by said computing device, a portion of said resources to said highest priority group of said plurality of priority groups based on said optimizing said first mathematical linear programming model;
 - determining, by said computing device, each iterative solution for remaining ones of said plurality of priority groups in order of said rank ordering of said customer demands using results from a previous mathematical linear programming model solution;
 - assigning, by said computing device, portions of remaining resources to a next highest priority group of said plurality of priority groups based on said determining each iterative solution;
 - outputting, by said computing device, said production plan based on said assigning resources;

independently determining, by said computing device, backorder costs penalties for each of said plurality of priority groups using said computing device; and

assigning, by said computing device, by each successive mathematical linear programming model, a range of said backorder costs within a priority group of said plurality of priority groups to which resources are currently being assigned.

2. (Previously Presented) The method of claim 1, wherein said prioritized customer demands are hierarchical and comprises two or more levels of hierarchy.

3. (Cancelled).

4. (Previously Presented) The method of claim 1, wherein said mathematical linear programs solved in each iteration use the solution to the previous mathematical linear program as a starting solution.

5. (Previously Presented) The method of claim 1, further comprising adding constraints to said mathematical linear programming models at each iteration ensure a feasible starting solution for re-optimizing said mathematical linear programming models.

6. (Original) The method of claim 1, wherein said method uses a different mathematical linear program for each iteration.

7. (Previously Presented) The method of claim 1, wherein said assigning process solves said mathematical linear programs for higher prioritized customer demands before solving

said mathematical linear programs for lower prioritized customer demands.

8. (Previously Presented) A computer-implemented method of assigning resources to a hierarchy of prioritized customer demands in a linear programming production planning system for determining a production plan, said method comprising:

receiving customer demands for resources from different customers;

rank ordering, by a computing device, said customer demands to create prioritized customer demands;

aggregating, by said computing device, said prioritized customer demands into a plurality of priority groups based on said rank ordering of said customer demands;

optimizing, by said computing device, a first mathematical linear programming model based on processing a highest priority group of said plurality of priority groups;

assigning, by said computing device, a portion of said resources to a highest priority group of said plurality of priority groups based on said optimizing said first linear programming model;

assigning, by said computing device, portions of remaining resources to a next highest priority group of said plurality of priority groups using a second mathematical linear programming model, wherein said second mathematical linear programming model uses results from said first mathematical linear programming model;

repeating said process of assigning portions of remaining resources, by said computing device, to remaining groups of said plurality of priority groups in order of priority, wherein each subsequent mathematical linear programming model uses results from a previous linear programming model; and

outputting, by said computing device, a production plan based said assigning resources, wherein during said assigning processes, each mathematical linear programming model assigns a range of backorder costs within the priority group of said plurality of priority groups to which the resources are currently being assigned.

9. (Previously Presented) The method in claim 8, wherein when repeating said process of assigning remaining resources, said method uses a different linear programming model for each repetition of said process of assigning remaining resources.

10. (Currently Amended) The method in claim 9, wherein each different linear programming model uses ~~as an initial constraint~~ a program solution of the previous linear programming model.

11. (Previously Presented) The method in claim 8, wherein during said assigning processes, each linear programming model fixes variables associated with priority groups that have a lower priority than the priority group to which the resources are currently being assigned.

12. (Cancelled).

13. (Original) The method in claim 8, further comprising dividing said priority groups into different sub-priority tiers.

14. (Previously Presented) The method in claim 13, wherein said sub-priority tiers can be processed simultaneously.

15. (Previously Presented) A computer-implemented method of assigning resources to a hierarchy of prioritized customer demands in a linear programming production planning system for determining a production plan, said method comprising:

receiving customer demands for resources from different customers;

rank ordering, by a computing device, said customer demands to create prioritized customer demands;

aggregating, by said computing device, said prioritized customer demands into a plurality of priority groups based on said rank ordering of said customer demands;

optimizing, by said computing device, a first mathematical linear programming model based on processing a highest priority group of said plurality of priority groups;

assigning, by said computing device, a portion of said resources to a highest priority group of said plurality of priority groups based on said optimizing said first linear programming model;

assigning, by said computing device, portions of remaining resources to a next highest priority group of said plurality of priority groups using a second mathematical linear programming model, wherein said second mathematical linear programming model uses results from said first mathematical linear programming model;

repeating said process of assigning portions of remaining resources, by said computing device, to remaining groups of said plurality of priority groups in order of priority using a different mathematical linear programming model for each iteration, wherein each subsequent mathematical linear programming model uses results from a previous linear programming model; and

outputting, by said computing device, a production plan based said assigning resources, wherein during said assigning processes, each mathematical linear programming model assigns a range of backorder costs within the priority group of said plurality of priority groups to which the resources are currently being assigned.

16. (Currently Amended) The method in claim 15, wherein each different linear programming model uses ~~as an initial constraint~~ a program solution of the previous linear programming model.

17. (Previously Presented) The method in claim 15, wherein during said assigning processes, each linear programming model fixes variables associated with priority groups that have a lower priority than priority group to which the resources are currently being assigned.

18. (Cancelled).

19. (Original) The method in claim 15, further comprising dividing said priority groups into different sub-priority tiers.

20. (Previously Presented) The method in claim 19, wherein said sub-priority tiers can be processed simultaneously.

21. (Previously Presented) A program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform a method of assigning resources to a hierarchy of prioritized customer demands in a linear programming

production planning system for determining a production plan, said method comprising:

receiving customer demands for resources from different customers;

rank ordering said customer demands to create prioritized customer demands;

aggregating said prioritized customer demands into a plurality of priority groups based on said rank ordering of said customer demands;

optimizing a first mathematical linear programming model based on processing a highest priority group of said plurality of priority groups;

assigning a portion of said resources to a highest priority group of said plurality of priority groups based on said optimizing said first linear programming model;

assigning portions of remaining resources to a next highest priority group of said plurality of priority groups using a second mathematical linear programming model, wherein said second mathematical linear programming model uses results from said first mathematical linear programming model; repeating said process of assigning portions of remaining resources to remaining groups of said plurality of priority groups in order of priority, wherein each subsequent mathematical linear programming model uses results from a previous linear programming model; and

outputting, by said computing device, a production plan based said assigning resources, wherein during said assigning processes, each mathematical linear programming model assigns a range of backorder costs within the priority group to of said plurality of priority groups which the resources are currently being assigned.

22. (Previously Presented) The program storage device in claim 21, wherein when repeating said process of assigning remaining resources, said method uses a different linear

programming model for each iteration.

23. (Currently Amended) The program storage device in claim 22, wherein each different linear programming model uses ~~as an initial constraint~~ a program solution of the previous linear programming model.

24. (Previously Presented) The program storage device in claim 21, wherein during said assigning processes, each linear programming model fixes variables associated with priority groups that have a lower priority than the priority group to which the resources are currently being assigned.

25. (Cancelled).

26. (Original) The program storage device in claim 21, wherein said method further comprises dividing said priority groups into different sub-priority tiers.

27. (Previously Presented) The program storage device in claim 26, wherein said sub-priority tiers can be processed simultaneously.

REMARKS

[0001] The following paragraphs are numbered for ease of future reference. Claims 1-2, 4-11, 13-17, 19-24 and 26-27 are all the claims presently pending in this application. Claims 10, 16 and 23 have been amended to more particularly define the claimed invention.

[0002] Applicant further respectfully submits that no new matter is added to the currently amended claims, nor has the scope of the pending claims changed. Applicant respectfully traverses the rejections based on the following discussion.

[0003] Applicant has amended dependent claims 10, 16 and 23 related to the statement made by the Examiner in the Non-Final Office Action, "The rejection of claims 10, 16 and 23 under 35 U.S.C. §112, second paragraph are reasserted in light of Applicant's amendments. Note also the related objections below." However, no 35 U.S.C. §112, second paragraph rejection was maintained by the Examiner in the Non-Final Office Action of October 12, 2010.

I. THE PRIOR ART REJECTIONS

A. The 35 U.S.C. § 103(a) Rejection over Hegde further in view of Nagarur

[0004] Claims 1-2 and 5-6 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Hegde, et al., U.S. Pat. No. 7197469, (hereinafter "Hegde"), further in view of Nagarur, et al., "Production planning and scheduling for injection moulding of pipe fittings: A case study.", (hereinafter "Nagarur").

[0005] The Examiner alleges that one of ordinary skill in the art would have been motivated to modify Hegde with the teaching from Nagarur to form the invention of claims 1-2 and 5-6. Applicant submits, however that these references would not have been combined and even if combined, the combination would not teach or suggest each element of the claimed invention.

[0006] Applicant traverses the Examiner's rejection since, among other reasons, Hegde is directed toward dividing each of a priority ranked scheduled releases (Material Requirements Planning (MRP)) into "N" separate and smaller sized scheduled releases where the priority of each of the "N" releases may be equal to the priority of the original release. The "N" separate and smaller sized scheduled releases are sorted according to priority and then used to determine an optimal supply schedule for allocating resources including component supply and assembly capacity.

[0007] Meanwhile, Applicant's claimed invention is directed toward independently determining backorder costs penalties for each of a plurality of priority groups, and assigning by successive mathematical linear programming models, a range of said backorder costs within a priority group of the plurality of priority groups to which resources are currently being assigned.

[0008] More specifically, Applicant submits, that neither Hegde, nor Nagarur, nor any alleged combination thereof, teaches or suggests:

"independently determining, by said computing device, backorder costs penalties for each of said plurality of priority groups using said computing device,"

"assigning, by said computing device, by each successive mathematical linear programming model, a range of said backorder costs within a priority group of said plurality of priority groups to which resources are currently being assigned," per Applicant's independent claim 1.

[0009] Beginning on the bottom of page 5 of the Non-Final Office Action, the Examiner alleges that Applicant's claimed, "independently determining, by said computing device, backorder costs penalties for each of said plurality of priority groups using said computing device," is taught or suggested by "Hegde [5,5] refers to back ordering as a typical element of BCD (Best Can Do)

which uses linear programming as described in Hegde [4,26-7]. Note that in Hegde [5,7] states "material releases of equal priority have equal cost penalties ..." thus contemplates prioritization associated "with rationing resources", hence is associated with prioritized demands, but see below. See also Hegde [claim 2] which refers to smaller groups than the priority ranked release schedule which associates priority level with a group)."

[0010] However, nowhere does Hegde teach or suggest anything regarding "backorder costs penalties," and Applicant maintains that Hegde's term "equal cost penalties" has nothing to do with Applicant's claimed "backorder costs penalties."

[0011] On page 6 of the Non-Final Office Action, the Examiner alleges that Applicant's claimed, *"assigning, by said computing device, by each successive mathematical linear programming model, a range of said backorder costs within a priority group of said plurality of priority groups to which resources are currently being assigned,"* is taught or suggested by "Hegde [13,30] inter alia describes in Hegde claims 1 - 3 a grouping process based on priority. Hegde [5,2-7] states "As is known, LP used in BCD is formulated as a cost minimization problem where the objective function is comprised of costs for processing, shipping, back ordering, inventory holding, and material substitution, as well as negative revenues, all of which are linear in their respective decision variables."

[0012] Again, nowhere in Hegde is there any teaching or suggestion regarding Applicant's claimed, "backorder costs penalties."

[0013] Furthermore, on page 6, the Examiner admits that "Hedge does not teach that such groups are assigned backorder costs per se, but as shown above, Hedge [5,5] does describe costs for backordering and the need to match assets with demand - [2, 17]-, and the rationing of resources among competing demands -[1 ,25])." (Emphasis added.)

[0014] Hegde at column 5, line 5 merely states, “back ordering,” and at column 2, lines 17-18, to which the Examiner refers merely states, “...manufacturing industries is the matching of demand and assets over a set time period.” Applicant maintains that nowhere in these cited passages and nowhere else in Hegde is there any teaching or suggestion of Applicant's claimed, “backorder costs penalties,” to which Applicant's claims are directed.

[0015] On page 6 of the After-Final Office Action, the Examiner admits that, “Hegde does not specifically teach use of successive linear programming models, per se, or that each iterative solution uses results from a previous mathematical linear program solution,” and further alleges that “Nagarur [abstract] refers to a sequence of sub-problems involving use of linear programming methods. Nagarur [p.162, col. 2] further states “Establish the equivalent linear programming model for this priority level k. All the solutions obtained from previous steps are included as additional constraints.”

[0016] However, even assuming *arguendo* that the Examiner's position has some merit, Nagarur fails to teach or suggest, “independently determining, by said computing device, backorder costs penalties for each of said plurality of priority groups using said computing device,” and “assigning, by said computing device, by each successive mathematical linear programming model, a range of said backorder costs within a priority group of said plurality of priority groups to which resources are currently being assigned,” per Applicant's independent claim 1. Therefore, Nagarur fails to overcome the deficiencies of Hegde.

[0017] In summary, Hegde is directed toward dividing each of a priority ranked scheduled releases (Material Requirements Planning (MRP)) into “N” separate and smaller sized scheduled releases where the priority of each of the “N” releases may be equal to the priority of the original release. The “N” separate and smaller sized scheduled releases are sorted according to priority

and then used to determine an optimal supply schedule for allocating resources including component supply and assembly capacity. Meanwhile, Applicant's claimed invention is directed toward independently determining backorder costs penalties for each of a plurality of priority groups, and assigning by successive mathematical linear programming models, a range of said backorder costs within a priority group of the plurality of priority groups to which resources are currently being assigned.

[0018] Therefore, Applicant respectfully requests the Examiner to reconsider and withdraw this rejection since the alleged prior art references to Hegde and Nagarur (either alone or in combination) fail to teach or suggest each element and feature of Applicant's claimed invention.

B. The 35 U.S.C. § 103(a) Rejection over Hegde further in view of Nagarur and Hung

[0019] Claims 8-9, 15 and 21-22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Hegde, (hereinafter "Hegde"), further in view of Nagarur and Hung, et al., "A Production Planning Methodology for Semiconductor Manufacturing Based on Iterative Simulation and Linear Programming Calculations.", (hereinafter "Nagarur and Hung").

[0020] The Examiner alleges that one of ordinary skill in the art would have been motivated to modify Hegde with the teaching from Nagarur and Hung to form the invention of claims 8-9, 15 and 21-22. Applicant submits, however that these references would not have been combined and even if combined, the combination would not teach or suggest each element of the claimed invention.

[0021] Applicant traverses the Examiner's rejection since, among other reasons, Hegde is directed toward dividing each of a priority ranked scheduled releases (Material Requirements

Planning (MRP)) into “N” separate and smaller sized scheduled releases where the priority of each of the “N” releases may be equal to the priority of the original release. The “N” separate and smaller sized scheduled releases are sorted according to priority and then used to determine an optimal supply schedule for allocating resources including component supply and assembly capacity.

[0022] Meanwhile, Applicant’s claimed invention is directed toward independently determining backorder costs penalties for each of a plurality of priority groups, and assigning by successive mathematical linear programming models, a range of said backorder costs within a priority group of the plurality of priority groups to which resources are currently being assigned.

[0023] More specifically, Applicant submits, that neither Hegde, nor Nagarur, nor any alleged combination thereof, teaches or suggests,

“assigning...a portion of said resources to a highest priority group of said plurality of priority groups based on said optimizing said first linear programming model,” and

“wherein during said assigning processes, each mathematical linear programming model assigns a range of backorder costs within the priority group of said plurality of priority groups to which the resources are currently being assigned,” per Applicant’s independent claim 8, and similarly independent claims 15 and 21.

[0024] On page 9 of the Non-Final Office Action, the Examiner alleges that Applicant’s claimed invention, *“outputting, by said computing device, a production plan based said assigning resources, wherein during said assigning processes, each mathematical linear programming model assigns a range of backorder costs within the priority group of said plurality of priority groups to which the resources are currently being assigned,”* is taught or suggested by “Hegde [abstract] refers to a feasible production schedule, and in [11, 13] refers to an output of the

production scheduling system. Hegde in [4,8] refers to use of linear programming techniques which are used to compute the production plan.”

[0025] However, nowhere in the Hegde, and nowhere in the portions of Hedge cited by the Examiner (column 11, line 13, and column 4, line 8), is there any teaching or suggestion regarding Applicant's claimed, “range of backorder costs within a priority group.” Nowhere does the Examiner even specifically address this specific language of Applicant's claimed invention.

[0026] Furthermore, the Examiner on page 9 of the Non-Final Office Action admits that “Hegde does not specifically teach repeating said process of assigning portions of remaining resources, by said computing device, to the remaining groups of said plurality of priority groups in order of priority, wherein each subsequent mathematical linear programming model uses results from a previous linear programming model.”

[0027] However, the Examiner alleges that, “Nagarur [abstract] refers to a sequence of subproblems involving use of linear programming methods. Nagarur [p.162, col. 2] further states “Establish the equivalent linear programming model for this priority level k. All the solutions obtained from previous steps are included as additional constraints.” (emphasis [sic] added) hence corresponds to the aforementioned limitation.”

[0028] However, even assuming *arguendo* that the Examiner's position has some merit, Nagarur and Hung fails to teach or suggest, “*assigning...a portion of said resources to a highest priority group of said plurality of priority groups based on said optimizing said first linear programming model,*” and “*wherein during said assigning processes, each mathematical linear programming model assigns a range of backorder costs within the priority group of said plurality of priority groups to which the resources are currently being assigned,*” per Applicant's independent claim

8, and similarly independent claims 15 and 21. Therefore, Nagarur and Hung fail to overcome the deficiencies of Hegde.

[0029] In summary, Applicant's claimed invention is directed toward independently determining backorder costs penalties for each of a plurality of priority groups, and assigning by successive mathematical linear programming models, a range of said backorder costs within a priority group of the plurality of priority groups to which resources are currently being assigned.

[0030] Therefore, Applicant respectfully requests the Examiner to reconsider and withdraw this rejection since the alleged prior art references to Hegde and Nagarur and Hung (either alone or in combination) fail to teach or suggest each element and feature of Applicant's claimed invention.

C. The 35 U.S.C. § 103(a) Rejection over Hegde further in view of Nagarur, de Farias, Fakhouri and Leachman

[0031] Claims 4, 7, 10-11, 13-14, 16-17, 19-20, 23-24 and 26-27 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Hegde, (hereinafter "Hegde"), further in view of Nagarur further in view of de Farias, Fakhouri, U.S. Pat. No. 746147 and Leachman, (hereinafter "Nagarur, de Farias, Fakhouri and Leachman").

[0032] The Examiner alleges that one of ordinary skill in the art would have been motivated to modify Hegde with the teaching from Nagarur, de Farias, Fakhouri and Leachman to form the invention of claims 4, 7, 10-11, 13-14, 16-17, 19-20, 23-24 and 26-27. Applicant submits, however that these references would not have been combined and even if combined, the combination would not teach or suggest each element of the claimed invention.

[0033] The Examiner on page 11 of the Non-Final Office Action admits that "Hegde does not specifically teach the following limitations as shown, but Fakhouri, in an analogous art,

does...[at] [36, 18] [that] states "A scheme for performing the allocation of various resources based on the values for the various resources in the integer solution [sic] obtained in the previous step."

[0034] On page 12 of the Non-Final Office Action, the Examiner admits, "Hegde...does not specifically teach the following limitations as shown, but Fakhouri, [at] [5,14] states "For example, if two resources depend on a resource that can only support one of them, then one way to resolve the conflict is to allocate the scarce resource to the resource with higher priority."

[0035] On page 13 of the Non-Final Office Action, the Examiner admits, "Hegde does not specifically teach...each different linear programming model uses as a starting point a program solution of the previous linear programming model (see the rejection of claims 3 and 4 which cite Fakhouri regarding lower-level resource allocations.). Applicant respectfully traverses this rejection as improperly identifying the cited prior art as teaching or suggesting Applicant's claimed invention.

[0036] On page 13 of the Non-Final Office Action, the Examiner admits, "Hegde does not specifically teach...during said allocating processes, each linear programming model fixes variables associated with priority groups that have a lower priority than the priority group to which the resources are currently being allocated [but alleges] Fakhouri [38,40-2] teaches fixing variables according to the solutions of previous stages."

[0037] On page 14 of the Non-Final Office Action, the Examiner admits, "Hegde, does not specifically teach said sub-priority tiers can be processed simultaneously, but Fakhouri...[at] [4,55] teaches satisfying multiple constraints simultaneously, and in [26, 15] states "Tasks are defined such that (a) each task is computationally significant as to the bookkeeping costs of managing parallelism" (emphasis added) where 'parallelism' indicates simultaneous processing."

[0038] However, even assuming *arguendo* that the Examiner's position has some merit, Nagarur, de Farias, Fakhouri and Leachman fails to teach or suggest:

“independently determining, by said computing device, backorder costs penalties for each of said plurality of priority groups using said computing device,” “assigning, by said computing device, by each successive mathematical linear programming model, a range of said backorder costs within a priority group of said plurality of priority groups to which resources are currently being assigned,” per Applicant's independent claim 1, and

“assigning...a portion of said resources to a highest priority group of said plurality of priority groups based on said optimizing said first linear programming model,” and “wherein during said assigning processes, each mathematical linear programming model assigns a range of backorder costs within the priority group of said plurality of priority groups to which the resources are currently being assigned,” per Applicant's independent claim 8, and similarly independent claims 15 and 21. Therefore, Nagarur, de Farias, Fakhouri and Leachman fails to overcome the deficiencies of Hegde.

[0039] Therefore, Applicant respectfully requests the Examiner to reconsider and withdraw this rejection since the alleged prior art references to Hegde and Nagarur, de Farias, Fakhouri and Leachman (either alone or in combination) fail to teach or suggest each element and feature of Applicant's claimed invention.

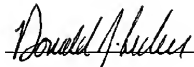
II. FORMAL MATTERS AND CONCLUSION

In view of the foregoing, Applicant submits that claims 1-2, 4-11, 13-17, 19-24 and 26-27, all of the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Assignee's Deposit Account No. 09-0456.

Respectfully Submitted,



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